COMPARISON OF LOSS ON IGNITION METHOD AND HYDROGEN PEROXIDE METHOD IN DETERMINING THE PERCENTAGE OF ORGANIC MATTER IN SOILS

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SUPERVISOR'S DECLARATION

I hereby declare that I have checked this thesis and in my opinion, this thesis is adequate in terms of scope and quality for the award of the Bachelor Degree of Civil Engineering

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I hereby declare that the work in this thesis is based on my original work except for quotations and citations which have been duly acknowledged. I also declare that it has not been previously or concurrently submitted for any other degree at Universiti Malaysia Pahang or any other institutions.

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Thesis submitted in fulfillment of the requirements
for the award of the
Bachelor Degree in Civil Engineering

Faculty of Civil Engineering & Earth Resources

UNIVERSITI MALAYSIA PAHANG

JAN 2019

ACKNOWLEDGEMENTS

Alhamdulillah, thanks to Allah the creator to all being up in the sky and on the earth because of His grace, I am still alive and have to do responsibilities given to me as a Muslim. First of all, I want to thank Dr Ngien Su Kong for guiding me to do this research from start until finish. I believe without his support and excellent supervision, this project never have been successful.

Besides that, I would like to thank all lecturers and staff in Universiti Malaysia Pahang (UMP) for the encouragement, advices and ideas that were given to me during this project. I will use all the knowledge and experiences that I have gain during the way to finish this project for work and future. Without their advice and guidance, it would be difficult for me to complete my project.

To my family especially my beloved parents and siblings because always provided me with full support and encouragement me along the journey of completing this final year project. Not forget a special to thank all my friends for their support and advice. Finally, nobody is perfect and as human I cannot run away from mistakes, I want to put ten fingers and apologies if there are mistakes.

.

ABSTRAK

Faktor hakisan tanah (faktor K) dari persamaan USLE mewakili penunjuk hakisan tanah bertindak pada kesan hujan, larian dan proses hakisan lain. Ia boleh terjejas oleh banyak faktor seperti jenis tanah, kadar penyusupan, kadar kebolehtelapan, dan kandungan bahan organik. Tujuan kajian ini adalah untuk memberikan perbandingan dalam menentukan peratusan kandungan bahan organik di dalam tanah. Sampel tanah untuk kajian ini dikumpulkan secara rawak. Sampel dianalisis untuk kandungan bahan organik menggunakan dua kaedah yang berbeza iaitu kehilangan pada kaedah penbakaran (LOI) dan kaedah pencernaan hidrogen peroksida (H_2O_2). Untuk kaedah LOI, ia lebih mengarahkan kaedah di mana sampel itu dinyalakan. Untuk kaedah H_2O_2, ia lebih rumit kerana menggunakan H_2O_2 yang dipanaskan untuk mengurai bahan organik di dalam tanah. Dari hasil yang diperolehi, kaedah LOI memberikan peratusan tertinggi kandungan bahan organik dengan kaedah H_2O_2. Jumlah bahan organik dalam tanah dengan kaedah H_2O_2 menunjukkan sedikit menurunkan nilai kepada kaedah LOI. Di samping itu, kaedah H_2O_2 kebanyakannya memberikan hasil yang rendah untuk beberapa sampel tanah. Tetapi dengan menggunakan kaedah H_2O_2 ia memberikan ralat yang lebih kecil semasa pengiraan peratusan kandungan bahan organik. LOI kadang-kadang memberikan hasil yang terlalu tinggi atau sangat rendah, dan kadang-kadang besar kesilapan. Ini kerana peratusan bahan organik hanya dikira kehilangan berat badan selepas pembakaran. Kesimpulannya adalah kaedah terbaik untuk menentukan peratusan kandungan bahan organik adalah dengan menggunakan kaedah LOI, tetapi penggunaan suhu untuk pembakaran perlu dipertimbangkan berdasarkan jenis tanah untuk memastikan ia menyelesaikan sepenuhnya tahap pembakaran tanah

ABSTRACT

The soil erodibility factor (K factor) of the USLE equation represents an indicator of the susceptibility of a soil to raindrop impact, runoff and other erosion processes. It can be affected by many factors such as soil type, infiltration rate, permeability rate, and organic matter content. The purpose of this study is to provide a comparison in determining the percentage of organic matter content in soil. Soils sample for this study were collected randomly. The samples were analyzed for organic matter content using two different methods whish are loss on ignition (LOI) method and hydrogen peroxide digestion (H_2O_2) method. For LOI method, it more directs method where the sample is ignited. For H_2O_2 method it is more complicated because it uses heated H_2O_2 to decompose the organic matter inside the soil. From the results obtained, the LOI method provided the highest but comparably similar percentage of organic matter content with the H_2O_2 method. The total organic matter in soils by H_2O_2 method shows slightly lowers value to the LOI method. In addition, the H_2O_2 method mostly gives low results for several soils sample. But by using H_2O_2 method it gives the smaller errors in during calculation of percentage of organic matter content. LOI sometimes gives too high or very low results, and occasional large the error. This because the percentage of organic matter is only calculated the loss of weight after combustion. Conclusion is the best method of determine the percentage of organic matter content is by using the LOI method, but the temperature use for combustion need to be consider based on the type of soils to make sure that it totally complete the combustion stage of soils.

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LIST OF SYMBOLS

%	Percentage
ºC	Degree Celsius
µm	Micro Metre
mm	Millimetre
ml	Millilitre
g	Grams
cc	Centimetre Cubic

LIST OF ABBREVIATIONS

LOI	Loss on Ignition
H_2O_2	Hydrogen Peroxide
USLE	Universal Soil Loss Equation
ASTM	American Society for Testing and Material
Cu	Coefficient of Uniformity
Cc	Coefficient of Gradation
BS	British Standard
K factor	Soil Erodibility Factor

CHAPTER 1

INTRODUCTION

1.1 Introduction

Organic matter is one of the most important components of soil (Schnitzer, 1978). Organic matter in soils is widely distributed over the earth surface occurring in almost all terrestrial and aquatic environments. The organic matter in soil are formed and produced by organisms such as plant and animals and also their waste product in the environment. From another perspective, organic matter content actually refer to the carbon compound that has been found naturally inside a soil that has gone through various stages of decaying process. For example, decaying process of fallen leaves, dead tree trunks, dead animals, or decaying roots. Each type of soil has a different content of organic matter. In some soil condition, there may be a high organic content in the top few inches of soil, but a very low content in deeper layers. Soil with high of organic matter is considered as fertile soils.

The organic matters in soil are important as helping component in soil that to stabilize the soil particles to decrease the soil erosion. For erosion control, based on study before was determine that data used in the Universal Soil Loss Equation (USLE) indicate that increasing soil organic matter from 1 to 3 per cent can reduce erosion 20 to 33 per cent. It happens because the water infiltration increase and stable soil aggregate formation caused by organic matter in that soil. Other than that, organic matters also help soil to improve the soil workability, enhance aeration and also as water penetration of soil. Besides that, soil organic matter also can increase water-holding capacity and also in same time can supplies nutrients for plants and soil micro-organisms to growth.

The determination of organic matter content can be determined using two different methods through combustion and chemical treatment. For the combustion method also known as loss on ignition, the method is straighter forward. When we heat a soil sample to a high enough temperature the organic matter literally begins to burn off. The mineral fraction of the soil is more resistant to combustion and remains behind. Thus, the weight loss during combustion reflects the weight of organic matter in the original sample. But for chemical method, we need to use hydrogen peroxide to test the content of organic matter.

Soil type, the vegetation and climatic conditions may affect not only the quantity, but also the quality of the organic matter of soil in uncultivated soils. There are many factors that affect the content of organic matter such as climatic conditions. The temperature and also rainfall give a major influence on the amount of organic matter found in soil. Usually in real life, forming of organic matter in soil is greater where there are more precipitation and lowest temperatures at surrounding area of soil.

1.2 Problem Statement

USLE equation can estimate soil erodibility (K) factor for soil series found. From the equation, the organic matter content in percentage value is one of important part to determine K factor. Based on the previous study of the USLE equation the difference percentage of organic matter content about 1 to 3 per cent will reduce 20 to 30 per cent of soil erosion.

The Organic matter is one of the most important components in soil. In other side, Organic content can affect the stability of soil in that time it also can affect the soil erosions. To get the percentage of organic matter content have varies method. Base on the previous study, the determinations the organic content are have two difference methods that is by H_2O_2 method and LOI method. There two different methods will give difference result for percentage organic matter content. H_2O_2 will discompose soil organic content by convert to carbon. While, the loss in ignition is the process when soil loss of weight of soil in burning process.

1.3 Objectives of Study

The purpose of this study is to determine the more suitable method of measuring organic matter to be used in USLE. The objective is to achieve the purpose are:

a) To determination the percentage of organic matter content in soil samples using Loss on Ignition (LOI) method and Hydrogen Peroxide (H_2O_2) method.
b) To determine the comparison of organic content by using of LOI method and H_2O_2 method and also discuss the best alternative methods based on the result get that give more accurate result.

1.4 Scope of Study

The total of sample collected was fourteen samples collected randomly around Kuantan. The samples collected were numbered from A to M. For sample collection, hand auger was used to collect the samples. The depth of sample collection is 0.5m below the ground level surface. The samples should be undisturbed soil samples. After that, the sample that has been collected was put in resealable plastic bags to avoid contamination of the samples.

This study is to estimate the determination of organic matter content for soil .The different percentage of organic matter in soil with give difference estimation of K value in estimation of soil erosion. This study was conducted two different methods in determine the percentage of organic matter in soil. Based on the laboratory testing, it shows that two different methods will give different percentage of organic matter content in soil.

For experiment work, the testing that were conducted are LOI and H_2O_2 method. Results from this study are used to compare and determine the best method to get the accurate percentage of organic matter content in soils. For all the procedure and reference of testing are accordance with ASTM, BS standard and Head (2006). For each type of soil sample are tested in three times for get more accurate percentage for each method in determining the percentage of organic matter in soils.

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